

Current Claims Schedule

1 1. (Previously Presented and Currently Amended) Microwave apparatus for measuring
2 blood flow rate in a patient's blood vessel, said apparatus comprising;
3 an intravascular catheter having proximal and distal ends and containing an inner
4 coaxial cable forming a first antenna and an outer cable coaxial with the inner cable and
5 forming a second antenna, said first antenna extending axially beyond the second antenna
6 a selected distance;
7 an extracorporeal control unit including a microwave transmitter which transmits
8 signals to the catheter, a microwave receiver which receives signals from the catheter,
9 and a processor controlling the transmitter and receiver, said processor including means
10 responsive to the timing of the transmitted and received signals for measuring said blood
11 flow rate, and
12 a diplexer connected between said first and second antennas and the control unit
13 for coupling signals from the transmitter to one of the antennas but not to the receiver and
14 for coupling signals from the other of the antennas to the receiver but not to the transmit-
15 ter.

1 2. (Original) The apparatus defined in claim 1 wherein
2 the transmitter transmits signals of a first frequency, and
3 the receiver is designed to receive signals of a second frequency different from
4 the first frequency.

1 3. (Original) The apparatus defined in claim 1 wherein the diplexer is contained in a
2 proximal end of the catheter.

1 4. (Original) The apparatus defined in claim 1 wherein
2 the transmitter transmits signal pulses to said one of the antennas and, each time,
3 sends a transmit signal to the processor;
4 the receiver sends a detect signal to the processor each time it detects a signal
5 from said other of the antennas, and
6 said processor includes means for determining the elapsed time between the re-
7 ception of a transmit signal and a subsequent detect signal and means for dividing that
8 time into the axial distance between said first and second antennas to compute said flow
9 rate.

1 5. (Original) The apparatus defined in claim 4 wherein the control unit also includes a
2 display device controlled by the processor for displaying the flow rate.

1 6. (Original) The apparatus defined in claim 1 wherein the inner coaxial cable is slidable
2 relative to the outer coaxial cable so as to allow adjustment of said selected distance.

1 7. (Original) The apparatus defined in claim 1 wherein the diplexer is mounted to a
2 proximal end of the catheter and includes

3 radially spaced-apart inner and outer tubular conductors surrounding a segment of
4 said inner coaxial cable and connected electrically to said outer coaxial cable;
5 a tubular side branch extending from said outer conductor;
6 a branch conductor extending from said inner conductor through said side branch
7 to form a port;
8 a short circuit between said inner and outer conductors at a distance from said
9 branch conductor to form a quarter wavelength stub at the frequency of the signal carried
10 by the outer antenna.

1 8. (Original)The apparatus defined in claim 7 wherein the inner coaxial cable is slidable
2 relative to the outer coaxial cable and inner conductor so as to allow adjustment of said
3 selected distance.

1 9. (Currently Amended) Microwave apparatus for measuring the blood flow in a patient's
2 blood vessel, said apparatus comprising

3 an intravascular catheter having proximal and distal ends and containing an inner
4 coaxial cable forming a first antenna and an outer coaxial cable forming a second an-
5 tenna, said first antenna extending axially beyond the second antenna a selected distance;
6 and

7 a diplexer at the proximal end of the catheter, said diplexer having radially
8 spaced-apart inner and outer conductors, said inner conductor snugly receiving the inner
9 coaxial cable and the inner and outer conductors being connected electrically to the outer

10 coaxial cable, said outer conductor having a tubular branch oriented substantially 90°
11 relative to the inner conductor and said inner conductor having a connection extending
12 through said branch and being spaced from corresponding shorted ends of the inner and
13 outer conductors to form a quarter wave stub at the frequency of the signal carried by the
14 second antenna, and
15 a control unit including a microwave transmitter which transmits signals via the
16 diplexer to the catheter, a microwave receiver which receives signals via the diplexer
17 from the catheter and a processor controlling the transmitter and receiver, said processor
18 including means responsive to the timing of the transmitted and received signals for
19 measuring said blood flow rate.

1 10. (Original) The apparatus defined in claim 9 wherein the inner coaxial cable is slidable
2 lengthwise relative to the outer coaxial cable and an inner conductor so as to allow ad-
3 justment of said selected distance.

1 11. (Original) The apparatus defined in claim 9 wherein the inner coaxial cable has an
2 open-ended tubular inner conductor which extends the length of the catheter.

1 12. (Currently Amended) Microwave apparatus for measuring blood flow in a patient's
2 blood vessel, said apparatus comprising
3 an intravascular catheter having proximal and distal ends;
4 a diplexer at the proximal end of the catheter, said diplexer including

5 a radially outer tubular conductor having a tubular side branch, and
6 a radially inner tubular conductor spaced from the outer conductor and
7 having a connection extending through the side branch of the outer conductor to the out-
8 side to form a first port, said inner and outer conductors having proximal ends which are
9 short circuited to form a quarter wave stub between said proximal ends and the side con-
10 nection of the inner conductor;

11 a first antenna at the distal end of the catheter, said first antenna including radially
12 inner and outer electrically insulated tubular conductors connected electrically to the re-
13 spective inner and outer conductors of the diplexer; and;

14 a second antenna at the distal end of the catheter spaced axially beyond the first
15 antenna, said second antenna including a coaxial cable having an inner conductor and
16 which extends through the inner conductor of the diplexer to the outside to form a second
17 port; and

18 a control unit including a microwave transmitter which transmits signals via the
19 diplexer to the catheter, a microwave receiver which receives signals via the diplexer
20 from the catheter and a processor controlling the transmitter and receiver, said processor
21 including means responsive to the timing of the transmitted and received signals for
22 measuring said blood flow rate.

1 13. (Original) The apparatus defined in claim 12 wherein the coaxial cable is slidable
2 within the inner conductors of the first antenna and diplexer to adjust the axial distance
3 between the first and second antennas.

1 14. (Original) The apparatus defined in claim 12 wherein the inner conductor of the co-
2 axial cable of the second antenna is an open-ended tube adapted to slidably receive a
3 guide wire.

1 15-18. (Cancelled)